Course Syllabus: MAT 275 – Calculus III

Fall Semester 2013

Instructor: Ulrich Hoensch, Ph.D.

- E-mail: `hoenschu@rocky.edu`

- Office: Morledge/Kimball 118

- Office Phone: (406)-657-1126

- Office Hours:

  - Monday 8:00 a.m.-10:00 a.m. and 1:00 p.m.-2:00 p.m.
  - Tuesday 1:00 p.m.-2:00 p.m.
  - Wednesday 8:00 a.m.-10:00 a.m. and 1:00 p.m.-2:00 p.m.
  - Thursday 1:00 p.m.-2:00 p.m.
  - Friday 8:00 a.m.-10:00 a.m.

  and other times by appointment.

Class Information

- Credits: 3 semester hours

- Class Meetings: Monday, Wednesday, Friday 12:00 noon - 12:50 p.m.

- Room: Bair 102

- Class Web Page: `www.rocky.edu/~hoenschu/FS_2013/MAT275/main.html`

Text   Weir/Hass, *Thomas' Calculus: Early Transcendentals*, Twelfth Edition, Addison-Wesley ISBN 0-321-58876-2 (required).

Course Description   This course is a continuation of MAT 176, Calculus II. Vector functions of one or more real variables, scalar functions of several variables, multiple integration, and surface theory via vectors are among the topics studied. Increasing emphasis is placed on mathematical proofs. Prerequisite: A grade of "C" or higher in MAT 176.

Rationale   MAT 275 is a required class for a major and a minor in mathematics and the mathematics education major. It is a highly recommended course for students intending to enter graduate school, or a comparable professional program, in the areas of mathematics, engineering, chemistry and physics.

Course Objectives   At the completion of MAT 275, students will be able to:

(1) Analyze vector-valued functions by finding derivatives and computing curvature, tangent and normal vectors.

(2) Analyze vector-valued functions in 3-space by finding bi-normal vectors and computing torsion and the TNB-frame of a curve.

(3) Use and interpret functions of several variables by finding limits and partial derivatives.

(4) Graph functions of two variables in various ways.

(5) Use the chain rule for functions of two variables and find gradient and directional derivatives.

(6) Find local extrema and saddle points of functions of two variables.

(7) Perform multiple integration, and apply it to problems involving area, volume, and surface area.

(8) Use cylindrical and spherical coordinates in space, perform changes of variables in two and three dimensions.

(9) Compute and apply the main concepts in vector calculus: vector fields, line integrals, curl and divergence.

(10) Use and apply Green's Theorem, the Divergence Theorem, and Stokes' Theorem.

Program Outcomes   This course addresses the following student learning outcomes for the mathematics major:

- Establish mathematical results using a variety of proof techniques;

- Exhibit knowledge of relevant definitions, techniques and mathematical results;

- Perform symbolic manipulation of high-level mathematical objects;

- Solve problems involving high-level mathematical objects;

- Use advanced mathematical techniques to solve problems in real-world situations.

Methods of Evaluation   Students will be evaluated based on the following evidence.

- Exams and homework assignments.

- Attendance record, timeliness, the amount of courtesy and respect extended towards fellow students and the instructor.

- Level of academic and personal honesty and integrity.

Criteria for Grade Assignment   To receive a passing grade, a student must show evidence that she/he is able to successfully perform the tasks laid out as course objectives (see above). Furthermore, students must attend all class meetings, arrive on time and exhibit appropriate classroom and social behavior. More specifically, a student is required to have accrued at least 70% of possible points to meet these criteria (see below). In addition, all submitted work must be the student's own work, or if it is not, names of sources or collaborators must be identified.

Possible points will come from:

- A midterm exam and a final exam, each worth 200 points; here students must submit only their own work, by using only a graphing calculator, or other explicitly permitted material. Both the midterm and the final exam will have an in-class component (worth 100 points) and a take-home component (worth 100 points). **The take-home component of the exams must be turned in no later than the indicated due date.**

- Several homework assignments worth a total of 200 points.

This amounts to a total of 600 possible points. The following grading scale will be used to assign grades.

A: 90%, or more   B: 80% - 89%   C: 70%-79%   F: less than 70% of possible points.

Instructional Methods and Experiences   The format of this class is that of a small-class lecture. Student participation in the lecture is encouraged. Study groups outside of class are strongly recommended. However, completion of take-home exams must be done independently by each student.

Class Policies   Students are required to attend all class meetings and complete all assignments. All homework assignments must be submitted at the beginning of class on the due date. Late homework will not be corrected and will receive no credit, regardless of circumstances or personal emergencies. Other in-class assignments, including tests and exams, must be completed in the time allotted by the instructor. All work on tests and exams must be the student's own work, and may only be obtained through the use of explicitly allowed tools. Homework assignments must be completed independently by each student. Tests and exams may only be made up if the instructor is notified in advance of qualified absences. Qualified absences are limited to the following: (a) activities connected with Rocky Mountain College programs; (b) grave illness (in which case a doctor's note is required); (c) a family or personal emergency, or due to force majeure. In case (a), students must inform the instructor prior to their absence. In cases (b) and (c) above, students may be excused from assignments if they notify the instructor immediately after their absence.

College Academic Policies   Students must abide by all Academic Integrity Policies of the College. See `http://www.rocky.edu/academics/course-catalog/FormsPolicies.php` for details.

Date	Remarks/Topics
Mon Aug 26	12.1 Three-Dimensional Coordinate Systems
Wed Aug 28	12.2 Vectors
Fri Aug 30	12.3 The Dot Product
Mon Sep 02	**Labor Day – No class**
Wed Sep 04	12.3 The Dot Product
Fri Sep 06	12.4 The Cross Product
Mon Sep 09	12.5 Lines and Planes in Space
Wed Sep 11	12.5 Lines and Planes in Space
Fri Sep 13	13.1 Curves in Space and Their Tangents
Mon Sep 16	13.1 Curves in Space and Their Tangents
Wed Sep 18	13.3 Arc Length in Space
Fri Sep 20	13.4 Curvature and Normal Vectors of a Curve
Mon Sep 23	13.4 Curvature and Normal Vectors of a Curve
Wed Sep 25	13.5 Tangential and Normal Components of Acceleration
Fri Sep 27	13.6 Velocity and Acceleration in Polar Coordinates
Mon Sep 30	14.1 Functions of Several Variables
Wed Oct 02	14.1 Functions of Several Variables
Fri Oct 04	14.2 Limits and Continuity in Higher Dimensions
Mon Oct 07	14.3 Partial Derivatives
Wed Oct 09	**In-Class Midterm Exam**
Fri Oct 11	**Take-home Component of Midterm Exam Due**; 14.4 The Chain Rule
Mon Oct 14	14.5 Directional Derivatives and Gradient Vectors
Wed Oct 16	14.6: Tangent Planes and Differentials
Thu-Fri Oct 17-18	**Mid-term Break**
Mon Oct 21	14.7 Extreme Values and Saddle Points
Wed Oct 23	14.7 Extreme Values and Saddle Points
Fri Oct 25	15.1 Double and Iterated Integrals over Rectangles
Mon Oct 28	15.2 Double Integrals over General Regions
Wed Oct 30	15.3 Area by Double Integration
Fri Nov 01	15.4 Double Integrals in Polar Form
Mon Nov 04	15.5 Triple Integrals in Rectangular Coordinates
Wed Nov 06	15.8 Substitutions in Multiple Integrals
Fri Nov 08	15.7 Triple Integrals in Cylindrical and Spherical Coordinates
Mon Nov 11	15.7 Triple Integrals in Cylindrical and Spherical Coordinates
Wed Nov 13	16.1 Line Integrals
Fri Nov 15	16.2 Vector Fields and Line Integrals: Work, Circulation, and Flux
Mon Nov 18	16.3 Path Independence, Conservative Fields, and Potential Functions
Wed Nov 20	16.4 Green's Theorem in the Plane
Fri Nov 22	16.5 Surfaces and Area
Mon Nov 25	16.6 Surface Integrals
Wed Nov 27	16.7 Stokes' Theorem
Thu-Fri Nov 28-29	**Thanksgiving Break**
Mon Dec 02	16.7 Stokes' Theorem
Wed Dec 04	16.8 The Divergence Theorem and a Unified Theory
Fri Dec 06	16.8 The Divergence Theorem and a Unified Theory
Tue Dec 10	**In-Class Final Exam, Time 12:15 p.m. - 2:15 p.m.**
Fri Dec 13	**Take-home Component of Final Exam Due at 12:00 noon**

OPI/PEPPS Standards

Standard	Course Objective
10.58.518 Mathematics	
(1) The program requires that successful candidates:	
(a) demonstrate knowledge and understanding of and apply the process of mathematical problem solving;	(3), (7), (9)
(d) recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding;	(3), (7), (9)
(e) use varied representations of mathematical ideas to support and deepen students' mathematical understanding;	(10), (11)
(f) appropriately use current and emerging technologies as essential tools for teaching and learning mathematics;	(4), (6), (9)
(3) demonstrate content knowledge in:	
(d) calculus by demonstrating a conceptual understanding of limit, continuity, differentiation, and integration and a thorough background in the techniques and application of the calculus;	(1), (2), (3), (4), (5), (6), (7), (8), (9), (10)